

are cleared out. Besides, the bottom halves of brick drains are usually laid dry on the ground without mortar or cement, and the consequence is that the greater part of the fluid which passes into them percolates through the joints of the bricks and is absorbed by the subsoil, and from this cause a drain cannot be considered otherwise than as a long and narrow line of cesspool. From the uneven manner in which the bricks are usually laid along the bottoms, and from the rubbish and pieces of mortar that are left within them as well, these protrusions present a succession of internal irregularities and stoppages; so that at every inch or so along the bottom and sides, the water, and animal and vegetable matter which is carried along in suspension with it, becomes arrested in its progress to the sewer; and consequently the soil becomes deposited upon the bottoms of the drains, and these, from this and other circumstances before referred to, ultimately become choked, and are thus rendered of no utility and service whatever in assisting the discharge of the sullage through them to the sewer. During the time the matter is collecting within the drains, and this may be going on for months together, the inhabitants are very much annoyed, and incessantly complain of foul vapours and stench, which emanate from the decomposition and fermentation of the accumulated matter through the various vents within and about the houses, and effluvia of the most filthy, noisome, and malignant description, are inhaled by them. It has very often been shewn clearly and forcibly that wherever bad drainage exists the surrounding atmosphere becomes vitiated and charged with malarial and poisonous gases, which have a most injurious effect upon the health of all those persons who reside in such places, and, very often, these gases are the cause of the production of virulent fevers. The use and abuse of cesspools have very often been spoken of, but I really cannot see what difference there can be between a cesspool, and a long line of ill-constructed drain, which runs under a house, and retains all, or nearly all, the filth which is discharged into it, and has to be cleared out periodically, precisely the same as a cesspool.

If drains are to be made at all, the workmanship should be made as clean, smooth, and perfect as possible, otherwise a cesspool is nearly as effectual: and it is only a waste of time and money in building drains without particular attention be observed in these points, and also in making them so as to prevent foul air and fluids from escaping through them. I have seen the interiors of tube drains whose calibre is exceedingly small, and have been in use many years, perfectly free and clear from deposits and accumulations, while the bottoms of large brick drains contiguous, were half-filled with deposited matter; their size and roughness causing the matter to lodge within them.

To all persons who are any way engaged in the formation of drains a knowledge of the scientific principles of statics and hydraulics is highly desirable; indeed, no drainage could be properly laid down and conducted without this knowledge and the dependance and manner of applying these principles to it. The proper and efficient drainage of a very great many houses in all parts of the metropolis are rendered altogether ineffectual from the circumstance of the bad and improper construction of their drains; and the facilities afforded by the sewers in carrying off the sullage are by this means of little or no avail. And the improvements which are yearly taking place in the metropolis by deepening and reconstructing the sewers, and otherwise affording good, efficient, and permanent drainage of premises, are in very many instances of no service, because no control is allowed to be exercised over the manner of forming and constructing private house-drains. It may appear somewhat difficult to legislate for the arrangement and construction of private drains, but most assuredly considerations and difficulties ought not to have any weight when it is observed that the building of a private drain and a sewer are so mixed up and blended together that the efficiency of both are rendered reciprocal, and are thus materially dependant upon their proper falls and constructions; for whenever the one is badly arranged in these respects the other is rendered almost useless in consequence. I have

very often been applied to and asked where the drain pipes in straight lengths and curved junctions, and of the description and strength which I have suggested could be procured. But from not knowing where such are to be obtained, if at all, I have not been able to give a direction, and thus recommend, and ensure their actual application to practice.

From the great impetus that is expected to be given to the manufacture of glass, in consequence of the repeal of the duty, I see no reason why cylindrical drain pipes of various diameters should not be made of glass, as such a form, and the smoothness of this material would afford facilities in accelerating the discharge of the drainage of houses into the sewers, that no other material could so well do. There is no question but that they could be made of sufficient substance and strength to enable them to resist very great pressures; and that they could be made with proper joints, and in lengths both curved and straight, with proper curved collateral junctions, convenient for using. The interiors of drains cannot be too smooth, for smoothness of surface and proper falls and sizes are the principal points to be observed in their construction. Good, thick, well-burnt cylindrical drain-pipes were very much in use in England about a century and a half ago, for I have seen and taken up many that were laid down about that time; and with all the boasted science and skill which has of late been shewn on the subject of drainage and sewerage, we are still considerably behind hand with what was done and generally practised by the Romans, especially in the drainage of their villas. This people used pipes of earth very extensively, both in the conveyance of water from springs and aqueducts to their houses, as well as in carrying off the drainage therefrom into the main sewers.

Whatever may be said in reference to the subject of tubular drains, it can have no other effect than of promulgating their efficiency, and of clearing the way for their use. As for the originality of proposing tubes for drains, it would be the height of absurdity and plagiarism in me to claim it: for what Pliny says in his natural history on the subject of drain-pipes would appear to set this matter at rest. He says that "If a man would convey water from any head of a spring, the best way is to use pipes of earth made by potter's art; and the same ought to be two fingers thick, and one jointed within another, so as the end of the upper pipes enter into the nether, as a tenon into a mortise, or as a box into the lid: the same ought to be united and laid even with quicklime quenched and dissolved in oil." And he says further that "the skill and knowledge of pottery is more ancient than foundry or casting brass;" and again "how beneficial is the earth unto us in yielding us conduit pipes for to convey water into our bairns." Now, whether any one else can lay claim to anticipation, invention, or originality in proposing the use of conduit or drainage pipes after this, I leave to competent and impartial judges to say. I hope, Mr. Editor, you will take every opportunity of recommending the employment of proper cylindrical tubes for the construction of drains, instead of the present mode of building them with bricks; so that by these means better drainage from houses may be produced, which must tend very much to sanitary improvement. Drains should never be constructed of a rectangular form, but should always be made circular, at least their bottoms should where the water runs; for if I take a barrel drain say of 9 inches diameter, its area is equal to 63.617 inches; and the side of a square drain having the same area is equal to 7.976 inches: therefore, now supposing that the quantity of water running through each of these drains to be equal and half full, then the semi-circumference being equal to 14.137 inches, the length of the base of the square added to half its height on each side is equal to 15.952 inches, or nearly 2 inches more. So that we have an actual retardation and loss of power in the stream through friction of nearly 2 inches by using the rectangular drain. And this is not the only loss of power in the stream, for the depth of the water in the square drain is less than that in the circular one by more than

half an inch, for in the former the depth is equal to 3.963 inches, and in the latter it is equal to 4.5 inches, the difference being equal to .537 of an inch. The hydraulic mean depth of each can be found by dividing the transverse area of the water expressed in square inches by the border of the section minus the upper surface of the water. We have a considerable loss of power in several ways by adopting a rectangular shape for a drain, therefore their use should be entirely abandoned; and I think no drains can be better formed, or can afford means of better and more effectually carrying off the animal and vegetable refuse from dwelling-houses than can be done by smooth cylindrical tubes. This letter has run out to a length that I originally did not contemplate, but the magnitude and importance of the subject must be its excuse.

I am, Sir, &c.

JOHN PHILLIPS.

#### THE BRITISH ARCHAEOLOGICAL SOCIETIES.

We continue to receive many letters relative to the discussion, the majority of which urge that members really anxious to effect a junction, should publicly pledge themselves not to attend either meeting at Winchester unless some arrangement be previously made. One gentleman, who signs himself "E. N." says:—

"Sir,—Your very excellent observations from first to last relative to the Archaeological Association are so very suitable to the occasion, and have so much enlisted my sympathies, that I beg to submit to you the question, whether the best mode of bringing the petty squabble to an end would not be for the nominal members to desire their names to be erased from the list; for my own part I thought it so discreditable to remain connected with a society so divided, that I have requested the secretary of each party to erase mine. It must be much regretted by every one who values antiquity, that from want of a business-like constitution the advantages that might have resulted from the co-operation of so many able antiquarians have been prevented."

Mr. Wansey, F.S.A., has addressed to us the following letter, which has also appeared in other journals:—

"Lamenting as we all must the dissensions which exist amongst us to our discomfort, injury, and reproach, I have been hoping some influential members would have come forward publicly to try and heal them. Anxious for the well-being of our association, I respectfully recommend,—that we stop not to inquire who is right or wrong; two rival societies together cannot be for good, and one is tempted to say 'a plague on both your houses;' while the world will jeer, and cry out, '*Tantum animis celestibus ira?*'"

Suppose both dissolve, and men the most considerable amongst us for character and station undertake to draw up laws to be submitted to a general meeting, for the government of one new society, embracing all, to be then constituted: officers, &c., to be chosen as usual. I see no better way of getting out of our present undesirable position, and take this mode of addressing you, as the most practicable.

Arborsfield, near Reading.

June 19, 1845."

We have the names of more than a dozen influential members who would willingly aid in restoring unanimity. It is said to be common in one part of India when there is any dissension between church and state, for a man to go to the top of a certain pagoda, and vow that if the quarrel be not terminated in twenty-four hours that he will return and throw himself off; and they further relate, that sooner than have the blood of the man upon their heads, both sides usually yield a little, and so the difference is adjusted. Can we not find some devoted friend to peace and quiet to try this move on Westminster Abbey, and thus literally, precipitate an amicable result? If it succeeded, we should claim a daily allowance of milk and honey for the rest of the year.

THE OFFICIAL REFEREE.—Mr. Higgins has resigned the office of referee under the Buildings Act.

\* Pliny's "Natural History," translated by Philemon Holland, 1634.